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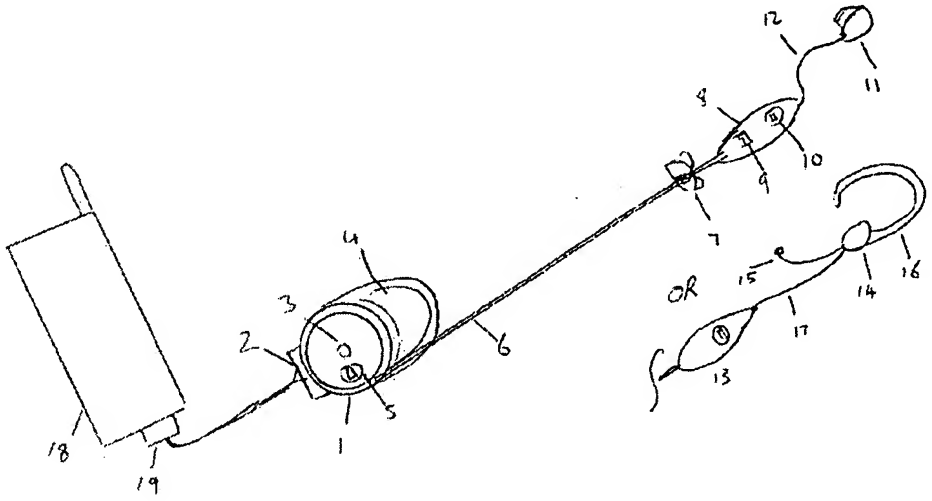
(54) Title: IMPROVEMENTS IN AND RELATING TO MOBILE TELEPHONES




(57) Abstract: The invention relates to improvements in and relating to mobile telephones and specifically an inexpensive nd easily produced method and apparatus for the Reduction of Radiation Exposure particularly to the head of Mobile telephone users. A self powered headset module consisting of a microphone and earphone means is connected to a mobile phone by duplex communicating means of an approximately one metre length of fibre optic cable and a special adapter which interconnects with the mobile phone itself. Signals from the microphone are modulated and sent down the fibre optic cable as series of light pulses. Similarly, the earphone signal from the mobile phone is sent up the fibre optic cable as a series of light pulse. The fibre optic cable provides a reliable, secure and interference free method of complete electrical isolation between the users head and the mobile phone.

WO 02/15422 A1

high cost of production of the technology has, up to this time, apparently prohibited their appearance in the general market place.

It is an object of the present invention to overcome all these problems at a very low cost due to novel and unique combination of design. It has been conceived from the outset for high levels of mass production with the clear intention to compete in the general market and be affordable, within the reach of all levels of the public particularly children who are at most risk.
The selling price will be similar to or even improve upon that of those "hands free sets" currently most popular in the market but which however, appear to offer no radiation exposure reduction but rather increase the risk.

**Summary of the Invention**
It is the object of the present invention to provide an affordable, inexpensive Radiation Reducing Device that can communicate both the earphone and microphone signal for the mobile phone to and from the head of the user without, at the same time, communicating the dangerously high levels of microwave radiation energy as experienced with conventional conductive devices currently in wide spread use.

The *first module* which is self powered by its own battery and includes the earphone and microphone is connected to and communicates with the mobile telephone by means of approximately one metre of plastic fibre optic cable and a *second module*.

The *second module* is connected to the Mobile telephone by an adapter connector means. This is either a direct electrical plug connection or a short length of adapter wire cable which can be used to adapt the device to any particular model of mobile phone by means of a variety of suitable adapter connectors.

The *first module* is worn on the head as with conventional "hand free sets" and/or clipped to the collar by means of a suitable clip. It is totally electrically isolated from the Mobile phone by means of the approximately one metre long length of fibre optic cable. This communicating fibre optic cable will conduct light signals but is entirely transparent to the microwave energy being transmitted by the mobile phone. There is no radiation conducting path or any sort of other electrically conductive path provided by the present invention between the mobile phone and the *first module* for the microwave energy to travel up. This is in direct contrast to the conventional "hands free sets" currently in wide spread use. They work by means of conventional conductive wires which provide a direct electrical connection between the mobile phone and the microphone and earphone and thus a easy path for conducting the intense microwave energy from the mobile phone directly to the head and most particularly into the delicate brain tissue behind the car.

The *first module* receives the earphone modulated light signal from the *second module* by means of the fibre optic cable. It translates this modulated light signal into an electronic analog signal which is then boosted and used to drive the earphone. The earphone forms part of the *first module* or is connected to it by means of a short length of conventional two conductor cable. The electronic signal from the microphone is conditioned to achieve a required frequency and dynamic response and then modulated into a signal suitable for transmission along the fibre optic cable.

The *second module* connects to the mobile phone with a direct conventional electrical connection. It translates the electronic earphone signal it receives from the mobile telephone into a modulated light signal suitable for transmission up the fire optic cable to the *first module*. It translates the modulated microphone light signal received from the *first module* by means of the fibre optic cable into an analog electronic signal suitable for the mobile phone. The second module may include a battery to provide the necessary power if it is not readily available from the mobile phone connection.

The *second module* forms part of (by means of a direct connecting plug) and/or is situated close to the mobile phone. The most benefit can be derived from the present invention if the *second module* and the mobile phone are placed away from the user on a table or some other suitable surface. The benefits of even a short distance of separation are large due to the fact that the intensity of radiation is proportional to the inverse of the distance squared. (This being the distance between the exposed part of the body and the mobile phone). However, the tissues of the brain are widely held to be the most vulnerable so that using the present invention while holding the mobile phone away from the body in your hand, preferably at arms length, will greatly reduce this exposure.

The fibre optic cable has a great advantage over wireless means in that the signals passed along it are, by definition, completely private and isolated from all forms of electronic interference. This is in direct contrast with wireless means all of which suffer from the problems of interference. The interference from which wireless means are vulnerable can come from many sources. One mechanism is the potential problem of interference from fellow users. If a number of mobile phone users were to make or receive calls while in close proximity to each other then there could be a very real possibility of these low power wireless transmissions being intercepted by the wrong head set. Additionally, modulated light signal can be efficiently sent along fibre optic cables using very low power, much lower than that required to send such signals by wireless infrared means. This is of particular concern in the present invention which seeks to provide two way isolation. Signals need to be sent both down from the *first module* for the microphone as well as received up for the earphone. It is not practical to use the relatively large and cumbersome batteries required in a light headset. Battery life is also of prime concern: very small and light batteries must provide extensive life.

**Brief description of the drawing Fig1**

The *first module* 1 comprises a battery 2 as an electrical power source, a low battery voltage detector 3, a light receiver 7 which receives a modulated light signal from the fibre optic cable 12 , an earphone light signal receiver 7, an earphone signal demodulation translator 6 which translates this modulated signal into an analog electronic signal, an earphone driver circuit 5, an earphone 4, a microphone 11, a microphone signal electronic preconditioner 10, a microphone analog signal translator 9 which translates the signal into a modulated form suitable for light transmission and a light transmitter 8 means connected to the fibre optic cable 6 means.

The second *module* (fig. 1) comprises a battery as an electrical power source 14 (if power is not readily available from the mobile phone "hands free set" plug in connection), a light

receiver18 which receives a modulated light signal from the fibre optic cable, a microphone light signal translator19 which translates the modulated signal into an analog electronic signal, a conventional conductive connector adapter which electrically connects the *second*

*module* to the mobile phone 20, an earphone analog signal translator16 which translates the analog earphone signal received from the mobile phone into a modulated form suitable for light transmission, a low battery detector 15, and a light transmitter means 17 connected to the fibre optic cable12.

**Description of preferred embodiments**

The embodiments of Fig 2 and fig 3:

**Fig 2** shows a preferred embodiment wherein the *second module* 1 consists of a fibre optic reel storage and supply mechanism with an automatic retracting button 3 in a plastic housing which also includes the second modules complete electronic circuit board, battery 5, a pouch for convenient storage of the first module 8 when not in use, an adapter connector means 2 & 19, a fibre optic cable means 6, a collar clip 7 to secure the first module and/or fibre optic cable to the collar, a plastic casing to house the electronic circuit board of the *first module* 8, a microphone 9, a battery 10, and ear phone for use inside the ear 11 a short length of two conductor interconnecting cable for the "in the ear" earphone 12 or alternatively for the case of a earphone and microphone supported by a clip over the ear: a plastic case13 housing the electronic circuit board and battery an interconnecting three or four conductor conventional cable 17, an earphone 14, an over the ear clip 16, a microphone 15 and a mobile phone 19.

**Fig 3** shows a preferred embodiment wherein the *first module* consists of a fibre optic reel storage and supply mechanism with an automatic retracting button 7 in a plastic housing 3 which also includes the *first modules* complete electronic circuit board, earphone and battery 6, an adapter connector means which houses the entire second module 1, a fibre optic cable means 2, a microphone boom 4, a head clip 5 for holding the *first module* in place and a mobile phone 8.

In the preferred embodiment inexpensive mechanical, fibre optic and electronic parts are used and combined in a novel and highly cost effective way to produce a complete assembly which is, even though considerably more complex that the conventional wire connected "hands free sets" currently in widespread use, still competitive in the market place at a similar price well within the financial reach of every concerned user. Battery size and battery life is of prime concern. In order to receive wide acceptance the whole assembly of the present invention must conveniently fit in the users pocket, preferably without the problem of becoming tangled in such a way as to be difficult to use the next time it is required. The fibre optic cable must be robust but easy to store away. This is the purpose of the windup mechanism for the fibre optic cable as described herein above and depicted in Fig 2 and 3.

The fibre optic cable may be single or a two core pair sheathed in a light blocking and protective material. In a preferred embodiment the core material is acrylic plastic and the sheath is also a plastic material. In the case of the single fibre, lenses are required at each end to separate the sent and received light signals for transmission and detection.. This can be expensive. In the preferred embodiment a two core pair is used and the modulation and demodulation of the light signals is be done in a very efficient and novel way using four

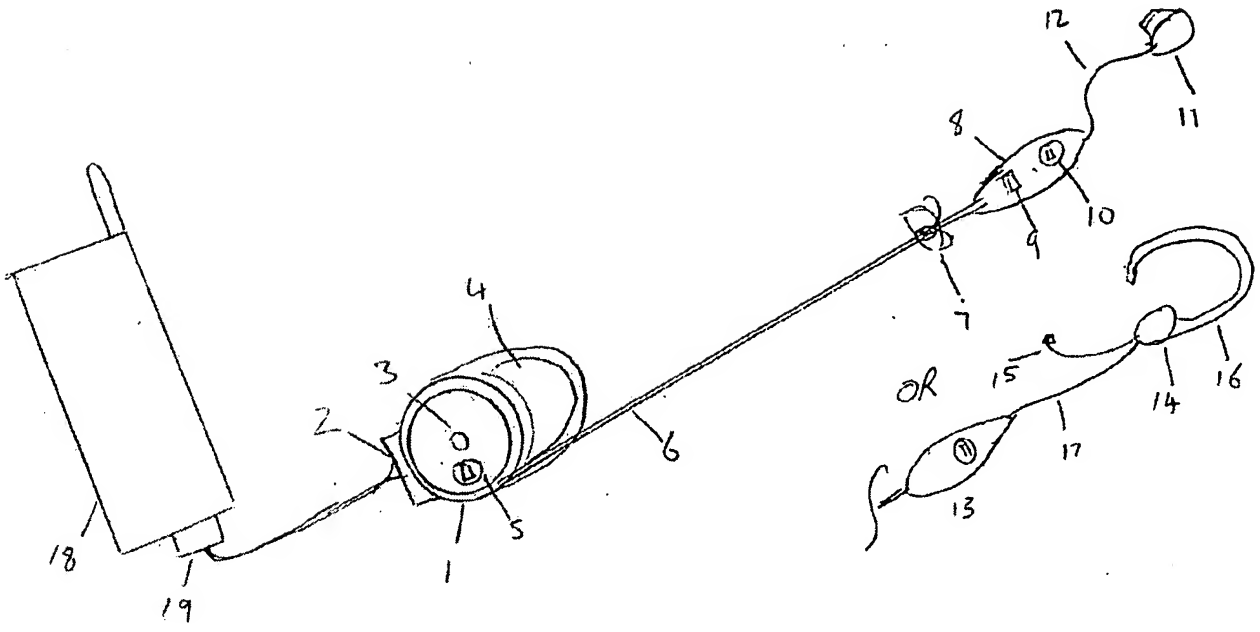



FIG 2

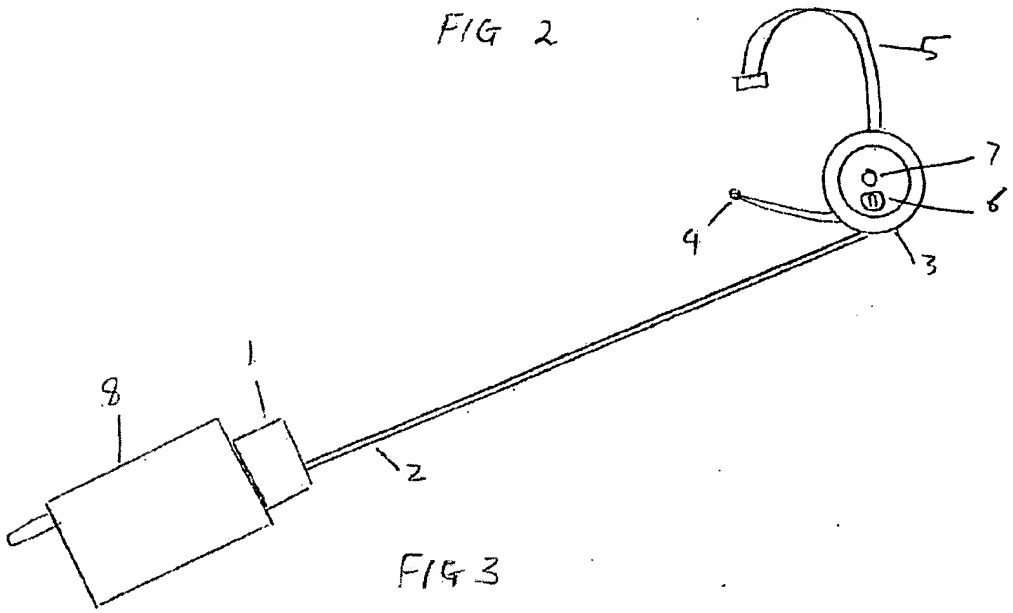



FIG 3

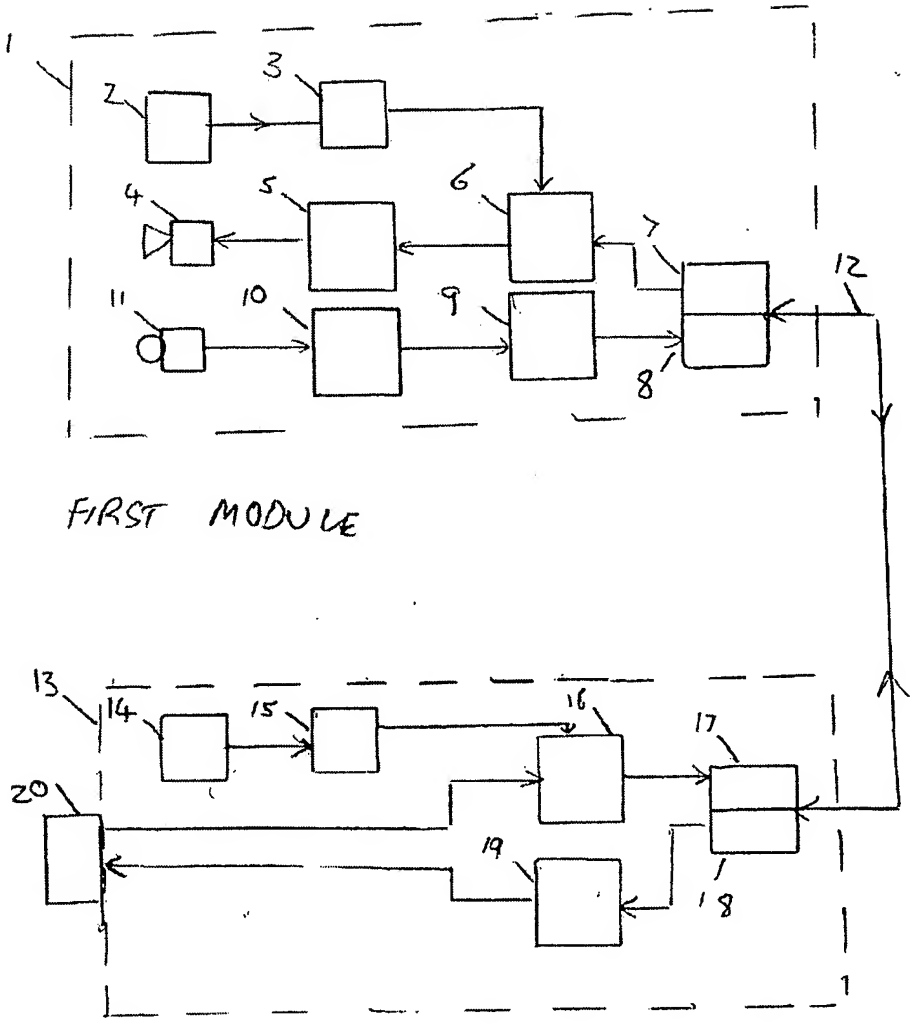



FIG 1 DRAWING